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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Ares J. Rosakis

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FISH & RICHARDSON, PC

P.O. BOX 1022

MINNEAPOLIS, MN 55440-1022

EXAMINER

JARRETT, RYAN A

ART UNIT

PAPER NUMBER

2121

NOTIFICATION DATE

DELIVERY MODE

02/05/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No. 10/766,512	Applicant(s) ROSAKIS ET AL.	
	Examiner RYAN A. JARRETT	Art Unit 2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 December 2008 and 30 September 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7, 16, 17, 19, 20, 26 and 27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7, 16, 17, 19, 20, 26 and 27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 February 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/17/08</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/30/08 has been entered.

Election/Restrictions

Applicant's election without traverse of claims 7, 17, 19, 20, and 27 in the reply filed on 08/07/06 is acknowledged. Claims 16 and 26 have been rejoined without prejudice and examined below.

Drawings

The drawings were received on 02/01/08. These drawings are acceptable.

Claim Objections

Claim 26 depends on a cancelled claim. It appears that it should be amended to depend from claim 20 instead.

Response to Arguments

Applicant's arguments, see pages 5-7, filed 09/30/08, with respect to the rejection(s) of claim(s) 7 under 35 U.S.C. 102(b) and claim(s) 17, 19, and 27 under 35 U.S.C. 103(a) as they relate to Wikstrom have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of A. Wikstrom and P. Gudmundson. "Stresses in Passivated Lines from Curvature Measurements" Acta Materiala 48 (2000) 2429-2434.

Applicant's arguments, see pages 5-7, filed 09/30/08, with respect to the rejection(s) of claim(s) 20 under 35 U.S.C. 102(b) as being anticipated by Wikstrom have been fully considered but they are not persuasive. Applicant argues, "Claim 20 is patentable over Wikstrom...because, as stated above for Claim 7, Wikstrom is completely silent on features related to 'parallel line features embedded in the dielectric layer'". However, Examiner notes that claim 20 is an apparatus claim, and that materials and articles worked on do not limit apparatus claims. Specifically, "Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim." *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, "[i]nclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." *In re Young*, 75 F.2d 996, 25 USPQ 69 (CCPA 1935) (as restated in *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)). See MPEP 2115.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7, 20, and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by A. Wikstrom and P. Gudmundson. “Stresses in Passivated Lines from Curvature Measurements” Acta Materiala 48 (2000) 2429-2434, hereinafter referred to as “Gudmundson”.

Gudmundson discloses:

7. A method for fabricating a layered structure on a substrate, comprising:

processing a substrate to form at least one dielectric layer on the substrate and parallel line features embedded in the dielectric layer (e.g., Fig. 1, pg. 2431 col. 1: “periodic straight lines”, pg. 2432 col. 2: “A square in-plane shape of the line was used with a width to pitch ratio, $b/d = 1/2$ ”);

obtaining local curvature information in an area of a line feature (e.g., pg. 2430 col. 2: “curvature measurements”);

obtaining local temperature information in the area of the line feature (pg. 2432 col. 1: “T temperature change from a stress free state”); **and**

using analytical expressions to compute local stresses in the line feature from a first contribution based on the local curvature information and a second, separate contribution based on the local temperature information, wherein the analytical expressions include geometry information of the line feature, the dielectric layer, and the substrate, and

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material information of the line feature, the dielectric layer and the substrate (e.g., Equation (13) substituting in Equation (8) for the average stresses, Section 2.2).

20. A system, comprising:

a substrate holder to hold a substrate fabricated with a dielectric layer and parallel line features embedded in the dielectric layer (e.g., Fig. 1, pg. 2431 col. 1: “periodic straight lines”, pg. 2432 col. 2: “A square in-plane shape of the line was used with a width to pitch ratio, $b/d = 1/2$ ”);

a sensing module to interact with the substrate to obtain information about a temperature (pg. 2432 col. 1: “T temperature change from a stress free state”) **and curvatures of a line feature on the substrate** (e.g., pg. 2430 col. 2: “curvature measurements”); **and**

a processing module programmed with analytical expressions to compute local stresses in the line feature from a first contribution based on local curvature information in an area having the line feature and from a second, separate contribution from local temperature information of the area having the line feature wherein the analytical expressions include geometry information of the line feature, the dielectric layer, and the substrate, and material information of the line feature, the dielectric layer and the substrate (e.g., Equation (13) substituting in Equation (8) for the average stresses, Section 2.2).

26. The system as in claim 25, wherein the layered structure comprises a capping layer on top of embedded line features and an adjacent top layer, wherein the processing module is programmed to include effects of the capping layer in the analytical expressions (e.g., Fig. 1, pg. 2431 col. 1: “periodic straight lines”, pg. 2432 col. 2: “A square in-plane shape of the line was used with a width to pitch ratio, $b/d = 1/2$. On top of the planar layer of thickness t , an

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additional planar passivating layer of thickness $a=t$ was placed such that $a + t = c'$, Equation (13), Section 2.2).

Claim 20 is rejected under 35 U.S.C. 102(b) as being anticipated by Wikstrom et al., “Thermoelastic analysis of periodic thin lines deposited on a substrate” (provided by Applicant), hereinafter referred to as “Wikstrom”. Wikstrom discloses:

20. A system, comprising:

a substrate holder to hold a substrate fabricated with a dielectric layer and parallel line features embedded in the dielectric layer (e.g., Fig. 1);

a sensing module to interact with the substrate to obtain information about a temperature (pg. 1123: “temperature change ΔT ”) and curvatures of a line feature on the substrate (e.g., pg. 1125: “curvature measurements”); and

a processing module (e.g., Equation (25)) programmed with analytical expressions to compute local stresses (e.g., Equations (6),(25): “ σ ”) in the line feature from a first contribution based on local curvature information in an area having the line feature (e.g., Equations (6),(25): “ e ”, Equation (5): “ e is a function of curvature “ k ”) and from a second, separate contribution from local temperature information of the area having the line feature (e.g., Equations (6),(25): “ ΔT ”), wherein the analytical expressions include geometry information of the line feature (e.g., Fig. 1: “ b ”, Equations (25)-(27)), the dielectric layer (e.g., Fig. 1: “ t ”, Equations (25)-(27)), and the substrate (e.g., Fig. 1: “ h ”, Equations (25)-(27)), and material information of the line feature (e.g., Fig. 1: “Line: E_f, ν_f, α_f ”, pg. 1120: “continuous film made of the same material as the line”, Equations (25)-(27)), the dielectric layer (e.g., Fig. 1: “ E_f, ν_f, α_f ”, pg. 1120: “continuous film made of the same material as the line”, Equations (25)-(27)) and the substrate (e.g., Fig. 1: “Substrate: E_s, ν_s, α_s ”, Equations (25)-(27)).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 16, 17, 19, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gudmundson as applied to claim 7 above, and further in view of WO 01/82335 A2.

Gudmundson discloses:

27. A method, comprising:

providing a layered structure which comprises a plurality of layers stacked over one another, wherein each layer has embedded line features (e.g., Fig. 1, pg. 2431 col. 1: “periodic straight lines”, pg. 2432 col. 2: “A square in-plane shape of the line was used with a width to pitch ratio, $b/d = 1/2$. On top of the planar layer of thickness t , an additional planar passivating layer of thickness $a=t$ was placed such that $a + t = c$ ”);

~~optically~~ obtaining information on a surface of the layered structure (e.g., pg. 2430 col. 2: “curvature measurements”);

processing the ~~optically~~ obtained information to extract curvature information of the surface (e.g., pg. 2430 col. 2: “curvature measurements”); **and**

applying analytical expressions to compute local stresses in a line feature from a first contribution based on extracted curvature information for an area having the line feature and from a second, separate contribution based on a local temperature at a location

of the line feature (e.g., Equation (13) substituting in Equation (8) for the average stresses, Section 2.2).

Gudmundson discloses curvature measurements, but does not explicitly disclose that the curvature measurements are obtained optically, per claim 27. Gudmundson also does not appear to explicitly disclose the features of claims 16, 17, and 19.

WO 01/82335 A2 discloses:

16. The method as in claim 7, further comprising:

computing a critical value for a change in temperature according to a failure criterion of the layered structure by using the analytical expressions (e.g., pg. 37 lines 1-22: "the stress-free temperature ranges of the line/substrate and film/substrate systems can be determined experimentally"); **and**

controlling a variation in temperature during fabrication to be away from the critical value (e.g., pg. 17 lines 8-13: "the processing parameters (e.g., temperature, duration or duty cycle) of each processing step may be adjusted either independently or in reference with the processing parameters of other processing steps to reduce the stresses").

17. The method as in claim 7, further comprising:

computing a critical value for a change in curvature according to a failure criterion of the layered structure by using the analytical expressions (e.g., pg. 33 lines 4-15: "Hence, when the difference either along or cross the line exceeds the acceptable level, the liability or performance of device may be considered as being unacceptable", pg. 22 lines 20-23: "measure temporal changes of curvature and associated stresses of a line feature in real time for many processes of semiconductor fabrication"); **and**

controlling a condition during fabrication to make a change in curvature to be away from the critical value (e.g., pg. 33 line 22 – pg. 34 line 1: “Hence, one or more aspects of the fabrication or the design of the devices may be examined and modified to reduce the residual stresses within the acceptable range”).

19. The method as in claim 7, further comprising adjusting a processing condition according to the computed local stresses (e.g., pg. 17 lines 1-4, pg. 33 line 22 – pg. 34 line 1).

27. optically obtaining information on a surface of the layered structure (e.g., Fig. 1 #102: “Optical Detection Module”);

processing the optically obtained information to extract curvature information of the surface (e.g., Fig. 1 #106: “Curvature Signal”)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Gudmundson with WO 01/82335 A2 since all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

It would have been further obvious to one having ordinary skill in the art at the time the invention was made to modify Gudmundson with WO 01/82335 A2 because the technique for improving a particular class of devices (i.e., improving a generic curvature measurement device by specifically require it to be an optical measurement device) was part of the ordinary capabilities of a person of ordinary skill in the art, in view of the teaching of the technique for improvement in other situations.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan A. Jarrett whose telephone number is (571) 272-3742. The examiner can normally be reached on 10:00-6:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (571) 272-3742. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ryan A. Jarrett/
Primary Examiner, Art Unit 2121

01/30/09